Unit 1 Review

CHAPTER 3 Study Guide

Key Concepts

3.3 Conversion Problems

- Multiplying by a conversion factor does not change the actual size of a measurement.
- Dimensional analysis provides an alternative approach to problem solving.
- Conversion problems are easily solved using dimensional analysis.

Table 3.1 Page 73
Table 3.2 Page 74

CHAPTER 6 Study Guide

Key Concepts

6.1 Organizing the Elements

- Chemists used the properties of elements to sort them into groups.
- Mendeleev arranged the elements in his periodic table in order of increasing atomic mass.
- In the modern periodic table, elements are arranged in order of increasing atomic number. The elements within a group in the table have similar properties.
- Three classes of elements are metals, nonmetals, and metalloids.

6.2 Classifying the Elements

- The periodic table displays the symbols and names of elements, along with information on the structure of their atoms.
- Elements can be sorted into noble gases, representative elements, transition metals, or inner transition metals based on their electron configurations.
- The periodic table can be divided into *s*, *p*, *d*, and *f* blocks that correspond to the highest occupied sublevels in atoms of elements.

CHAPTER 5 Study Guide

Key Concepts

5.1 Models of the Atom

- Rutherford's planetary model could not explain the chemical properties of elements.
- Bohr proposed that electrons move only in specific circular paths, or orbits, around the nucleus.
- The quantum mechanical model determines the allowed energies an electron can have and how likely it is to be found in various locations around the nucleus.
- Each sublevel of a principal energy level corresponds to an orbital shape describing where the electron is likely to be found.

5.2 Electron Arrangement in Atoms

- Three rules—the aufbau principle, the Pauli exclusion principle, and Hund's rule—tell you how to find the electron configurations of atoms.

CHAPTER 1 Study Guide

Key Concepts

1.1 Chemistry

- Because living and nonliving things are made of matter, chemistry affects all aspects of life and most natural events.
- Chemistry can be divided into five traditional areas of study: organic chemistry, inorganic chemistry, biochemistry, analytical chemistry, and physical chemistry.
- Pure research can lead directly to an application, but an application can exist before research is done to explain how it works.
- Chemistry can be useful in explaining the natural world, preparing people for career opportunities, and producing informed citizens.

CHAPTER 2 Study Guide

Key Concepts

2.1 Properties of Matter

- Properties used to describe matter can be classified as extensive or intensive.
- Every sample of a given substance has identical intensive properties because every sample has the same composition.
- Three states of matter are solid, liquid, and gas.
- Physical changes can be classified as reversible or irreversible.

2.2 Mixtures

- Mixtures can be classified as heterogeneous mixtures or as homogeneous mixtures, based on the distribution of their components.
- Differences in physical properties can be used to separate mixtures.

2.3 Elements and Compounds

- Compounds can be broken down into simpler substances by chemical means, but elements cannot.
- If the composition of a material is fixed, the material is a substance. If the composition may vary, the material is a mixture.
- Chemists use chemical symbols to represent elements, and chemical formulas to represent compounds.

2.4 Chemical Reactions

- During a chemical change, the composition of matter always changes.
- Four possible clues to chemical change include a transfer of energy, a change in color, the production of a gas, or the formation of a precipitate.
- During any chemical reaction, the mass of the products is always equal to the mass of the reactants.

Vocabulary

- chemical change (p. 48)
- chemical property (p. 53)
- chemical reaction (p. 53)
- chemical symbol (p. 51)
- compound (p. 48)
- distillation (p. 47)
- element (p. 48)
- extensive property (p. 39)
- filtration (p. 46)
- gas (p. 42)
- heterogeneous mixture (p. 45)
- homogeneous mixture (p. 45)
- intensive property (p. 39)
- law of conservation of mass (p. 55)
- physical change (p. 42)
- physical property (p. 40)
- precipitate (p. 54)
- product (p. 53)
- reactant (p. 53)
- solid (p. 41)
- solution (p. 45)
- substance (p. 40)
- vapor (p. 42)
- volume (p. 39)
  - liquid (p. 41)
  - mass (p. 39)
  - mixture (p. 44)
  - phase (p. 45)

CHAPTER 4 St ly Guide

Key Concepts

4.1 Defining the Atom

- Democritus believed that atoms were indivisible and indestructible.
- By using experimental methods, Dalton transformed Democritus's ideas on atoms into a scientific theory.
- Scientists can observe individual atoms by using instruments such as scanning tunneling microscopes.

4.2 Structure of the Nuclear Atom

- Three types of subatomic particles are electrons, protons, and neutrons.
- In the nuclear atom, the protons and neutrons are located in the nucleus. The electrons are distributed around the nucleus and occupy almost all the volume of the atom.

4.3 Distinguishing Among Atoms

- Elements are different because they have different numbers of protons.
- The number of neutrons in an atom is the difference between the mass number and atomic number.
- Because isotopes of an element have different numbers of neutrons, they also have different mass numbers.
- To calculate the atomic mass of an element, multiply the mass of each isotope by its natural percent abundance (expressed as a decimal), and then add the products.
- The periodic table lets you easily compare the properties of one element (or a group of elements) to another element (or group of elements).

Key Equation

- number of neutrons = mass number − atomic num

Vocabulary

- atom (p. 101)
- atomic mass (p. 115)
- atomic mass unit (amu) (p. 114)
- atomic number (p. 110)
- cathode ray (p. 104)
  - neutron (p. 106)
  - nucleus (p. 107)
  - period (p. 118)
  - periodic table (p. 118)
  - proton (p. 106)
    - Dalton's atomic theory (p. 102)
    - electron (p. 104)
    - group (p. 118)
    - isotopes (p. 112)
    - mass number (p. 111)